

# Internationalization of the Chemical Engineering Course at the Federal University of Latin American Integration: Challenges and Possibilities

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**Abstract**—*In order to understand the challenges, possibilities, and achievements of the chemical engineering course in Latin America, this article addresses the characteristics and difficulties of implementing the internationalization process in this higher education institution. This study is based on documentary information, as well as student testimonials. The Federal University of Latin American Integration (UNILA) aims at academic exchange and solidarity cooperation with Mercosul member countries and other Latin American countries. Among the numerous institutional challenges, there is the consolidation of bilingual teaching staff and the sociocultural and linguistic difficulties of adaptation for foreign students. This article shows that the barriers to adaptation are diverse and complex but have been constantly identified and solved over the six years of existence of the course, also shows the importance of the internationalization process of Latin American universities.*

## I. INTRODUCTION

The Federal University of Latin American Integration (Unila) has, as its vocation, the academic exchange and solidarity cooperation with Latin American countries (Brazil, 2019).

In its mission, Unila aims to train human resources able to contribute to Latin American integration, regional development and cultural, scientific and educational exchange of Latin America, especially the Mercosul, and for this, 50% of vacancies of all undergraduate courses are reserved for students from Latin America and the Caribbean. In 2019, around 30% of the vacancies were for foreign scholars (Unila, 2020) and the remaining vacancies were available for Brazilians.

In this way, internationalization is inherent to Unila and is part of its identity, as it offers a type of horizontal

cooperation (it happens for the benefit of both parties involved) and, central (it incorporates the international dimension into the university objectives and functions) (Abba, 2016).

This paper addresses the chemical engineering course, analyzing students from 32 countries (Unila, 2020). These students, besides forming the academic community of UNILA, they promote the cultural enrichment of Foz do Iguaçu city, which is also multicultural, formed by approximately 80 nationalities (Prefeitura Municipal de Foz do Iguaçu, 2020) and is located in the triple border between Brazil, Paraguay and Argentina.

In 2015, twelve courses were created at the University of Latin American Integration (Unila), among them, the Chemical Engineering course (Brazil, 2019), which is inserted into the academic, political and geographical

context mentioned above. It is from this context that this paper aims at addressing the issue related to the adaptability of foreign students and teachers, as well as discussing on the challenges to internationalization and also the main institutional challenges. In order to achieve this purpose, bibliographic and documentary research resources were used, at UNILA's Information and Institutional Regulation Coordination Office, as well as the testimonials of the graduates.

## II. RESULTS AND DISCUSSION

### 2.1 Course Overview and Students' Challenges

The Chemical Engineering degree program enrolled 264 students of 14 nationalities from its creation until the first semester of 2020. Table 1 shows the nationalities of the students on Unila's Bachelor Chemical Engineering Program. The course is formed by a majority of 189 Brazilian students, followed by the Paraguayan community, with 53 students (18.3%), besides the other two communities that are Haitian (16 students or 5.5%) and Colombian (11 students or 3.8%), which are also numerically relevant.

The data presented in Table 2 were obtained from annual reports, generated by the university information system and made available for the coordination of the Chemical Engineering (CE) Course at the Unila.

In the first semester of admission to the Unila, the Additional Basic Portuguese/Spanish course is compulsory. Thus, while Brazilian students must attend Spanish classes, the foreign students must attend Portuguese classes. Table 2 shows that students have occasional difficulties while attending these courses, even more so for Brazilians, in Spanish, than for foreigners, in Portuguese.

As internationalization requires this coexistence of academics of different nationalities, to minimize the initial language barrier, Unila offers an online Spanish-Portuguese course (CEPI-Unila). In this course, the target audience are students who have been accepted to the university and aim to get familiar to the Portuguese and Spanish languages. However, as these courses are optional, many students have their first contact with the Portuguese/Spanish language while they are attending classes from other course subjects, which are mostly taught by Brazilian lecturers. Proficiency on both languages is not a mandatory requirement for neither teachers nor the administrative staff.

*Table.1: Nationalities of the students in the Chemical Engineering course at UNILA.*

Nationality	Year of Entry						Total
	2015	2016	2017	2018	2019	2020	
Argentine	0	0	0	0	1	0	1
Bolivian	3	1	0	0	0	0	4
Brazilian	25	29	32	37	40	26	189
Chilean	1	0	0	0	0	0	1
Chinese	0	0	0	1	0	0	1
Colombian	0	3	3	0	3	2	11
Cuban	0	0	1	0	0	0	1
Dominican Republic	0	0	0	0	0	1	1
Ecuadorian	0	0	0	0	0	1	1
Haitian	11	1	0	0	1	3	16
Honduran	0	0	0	0	1	2	3
Panamanian	0	0	0	0	0	1	1
Paraguayan	10	11	10	13	5	4	53
Peruvian	0	1	1	0	2	1	5
Salvadoran	0	0	0	0	0	1	1
Venezuelan	0	0	0	0	1	0	1
<b>Total</b>	50	46	47	51	54	42	290

The foreign students who started in 2015 were pioneers and, thus, pathfinders of the language and the culture, and they are responsible for the first academic customs. Furthermore, they had to adapt to the city of Foz do Iguaçu, learn about the university's administrative structure, discover the bureaucratic intricacies of documentation and visas for staying in the country, among other difficulties inherent to the internationalization process. Therefore, they had greater difficulties to overcome at that year, and no veteran students of the same course to give them support. Thus, these students showed a higher failure rate than the Brazilian students, what can be seen in Table 2.

The increase in approvals of Brazilian and foreign students over the years is probably due to the increased interaction between students, the knowledge of the administrative structure of Unila, the knowledge of the local culture, communication and information networks created for problem solving, the improvement of pedagogical approaches of teachers, aimed at foreign students, as well as the improvement of the reception of these students, by Unila and by the creation of a student directory, consolidated in 2018.

Table.2: Failure of newcomers in the 1st semester subjects of the CE Course.

Discipline		Disapproval per year				
		2015	2016	2017	2018	2019
Introduction to Chemical Engineering	B	6	5	4	2	18
	F	18	2	4	2	3
Analytical Geometry	B	10	14	15	15	32
	F	23	16	12	11	9
Portuguese/Spanish Additional Basic	B	2	3	2	2	14
	F	0	1	3	1	0
General Chemistry	B	8	8	5	9	18
	F	21	4	8	8	8
Experimental General Chemistry	B	5	7	4	5	18
	F	14	5	6	8	7
Foundations of Latin America I	B	1	2	3	2	8
	F	0	1	2	1	1
Technical Drawing	B	2	3	2	0	12
	F	6	4	4	0	0
Pre-Calculus	B	3	15	9	*	*
	F	18	15	7		

Brazilians (B), Foreigners (F), \* Removed from the grid

The selection process for foreign students at Unila has been carried out through the internet since 2016, which contributed to broadening the dissemination of this process, in addition to enabling any student from Latin America to apply for a course, following the rules of the announcements of the International Relations department (Proint/Unila).

Internationalization is not an immediate process neither in a university, nor in a course, since it involves a process of institutional learning, a correction of actions and an adaptation of internal processes over the time (Abba & Corsetti, 2016), as has been performed at Unila during these years.

## 2.2 Internationalization from a Student Perspective and the Latin American Job Market for Chemical Engineers

According to the Boston Consulting Group, 26% of all companies, with more than US\$ 1 billion in revenue and located in Latin American countries (Multilatinas), are Brazilian companies, therefore, there is interest from many companies in profiles of professionals with communication skills besides language knowledge, as well as knowledge about the Latin American market. Multilatinas are strong

contributors to productivity, investment, innovation, and job creation and will continue to boost Latin America on the international scene (Aguiar et al., 2018).

Therefore, there is a demand for professionals with competitive skills to work in Multilatinas. In this context, the multicultural knowledge that Brazilian culture and the UNILA provides, combined with the process of bilingual education, is a differential for academics trained by the institution, contributing to the process of integration of Latin America.

Below, we present some excerpts of statements from CE students (A1, A2, A3, A4 and A5) in which these students describe how the Unila's internationalization process can influence the development of skills and promote insertion in the LA job market.

The academics who participated in the study are part of the first year of the course (2015), are Brazilians and foreigners, some of them have developed scientific initiation activities, extension projects, academic mobility and participated in the course student directory.

The academic A1, in his statement, explains the relevance of multicultural experience, the ability to manage people and conflicts, the communication and integration apprenticeship, as transcribed below.

"[...] the process of internationalization of the Unila is a strong point that deserves to be highlighted in our training, for allowing us to immerse ourselves both in the cultures and in the learning of new languages, the conflict management. As foreigners, we learned to mingle with others, integrate and develop new skills concerning people management, even without having taken any specific course related to this. [...]" (A1, 2020)

According to A2, the course was also an opportunity to live with people from different cultures and to learn the Spanish language.

"I found it great to know different cultures... I had the opportunity to learn a little bit from each of my colleagues who were not from Brazil, it helped me a lot with the issue of the Spanish language... [...]" (A2, 2020)

For A3, the experience in a multicultural environment made it easier the professional relationship with people in the work environment (during the internship).

"[...] the environment with mixed cultures added a lot of knowledge either in my academic or personal life, especially in the work environment as the internship, in which the professional relationship with different people becomes easier and respectful, promoting a better harmonization in the work environment [...]" (A3, 2020)

A4 believes that Unila enabled his personal development, mainly associated with the interpersonal relationships in a multicultural environment.

"[...] made me grow a lot as a person, respect others and their different cultures, as well as this is a differential aspect we incorporate when it happens, we have to work in an industry, because the interpersonal relationship counts a lot. [...] Unila is like living in other countries "without leaving home" [...]" (A4, 2020)

For A5, Unila provided him with numerous possibilities and experiences, such as the challenge he faced when chose to leave a more traditional Brazilian university to study at the Unila, a new university with a course under implementation. Another aspect was the opportunity for having contact, on Brazilian soil, with native Spanish speakers and their cultures, as well as the experience of adaptation in another country, through academic mobility.

"It was a choice for me to change the old university to face this new challenge. [I already had contact with the Spanish language [...] however, I had never had contact with native people [...] The highlight was the exchange opportunity, with Spanish [...] to one of the most sought-after universities in exchange in Latin America, UNAM (México). After that, I went in search of internships [...] I got two jobs in multinationals, both were very interested in the purpose of the Unila [...] One of the companies asked me if I would have problems living with people from other countries, and I believe that the answer was what they wanted to hear: "I have gotten along well with people from other countries since my first year at university. " [...]" (A5, 2020)

The testimonials of the CE Undergraduate Course students were diverse and showed that, while some of them were able to explain the skills and competencies that the Unila's internationalization process enables, others described the distinct opportunities that the university provides.

### III. CONCLUSION

The consolidation of Unila, as a plural and democratic university, also goes through the strengthening and construction of technological areas and engineering courses, focused on the interests of the market in line with the Brazilian and Latin American interests. Therefore, investment in education and research focused on technological areas is fundamental for the growth, integration and strengthening of universities, industry and the economy in Latin America.

The statements of the CE students showed that students were able to identify the skills and competences developed,

which are a differential of The Unila, for insertion into the world of jobs, while others described the opportunities that the institution provided. Among the skills mentioned, both explicitly and implicitly, was the improvement in the ability to deal with language in a professional context in a multicultural group.

Over the six years of the course's existence, it has been possible to verify the existence of problems that have hindered the effective fulfillment of the Unila's mission, such as the lack of care with bilingualism at the Unila due to the lack of preparatory courses being offered, as well as student selection criteria that evaluate prior knowledge of Spanish or Portuguese, and also the lack of policies to foster professors bilingual formation.

However, despite the difficulties pointed out, it can be observed that there has been a drop in failure rates at the first semester subjects over the years, indicating that the students have some support from the institution and are making a difference in the process of inclusion and belonging, both inside the Unila and after graduating, with the insertion of these engineers into the Latin American job market. The internationalization process of the Unila's Chemical Engineering course proves to be viable and successful in training professionals.

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